



# Commercial Marine Emission Inventory

Conference on Marine Vessels and  
Air Quality

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## Overview

- Inventory methodology
- NO<sub>x</sub>, PM inventories for 2000
- Projected NO<sub>x</sub>, PM inventories
- NO<sub>x</sub> Inventories for selected areas

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# Inventory Methodology

## ■ Inventory prepared for 1999 rule

- National inventory
  - » C1 marine contribution to ambient air quality in commercial ports, along waterways may be higher
- Engines included in inventory
  - » Commercial, recreational, auxiliary
  - » 3 engine categories (standards based on these)

Category	Displacement per cylinder
1	Displ. < 5 liters (and power $\leq$ 37 kW)
2	5 liters $\leq$ displ. < 30 liters
3	Displ. $\geq$ 30 liters

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# Inventory Methodology

## – C1 methodology

$$Emissions = Population \times Power \times Load \times Annual Use \times Emission Factor$$

## – C2 engine based on Corbett & Fischbeck analysis

- » US Flag: Main engine data and ship operation profiles
  - Similar to C1 methodology
- » Foreign Flag: Cargo transported on foreign vessels in US ports

$$Emissions = Emissions_{TonMile} \times TonMiles_{year}$$

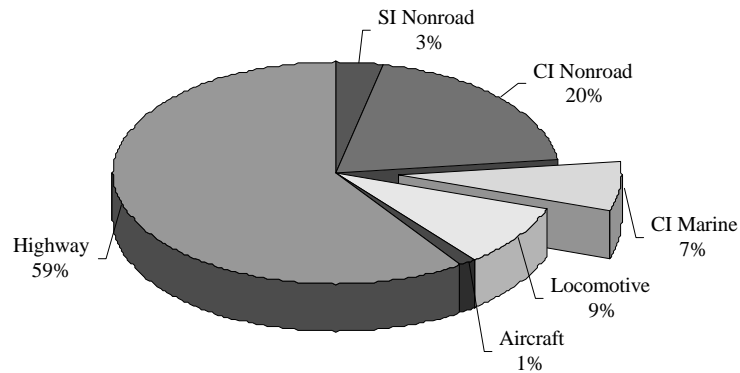
- » Rely on Lloyd's Register database
  - Does not include vessels less than 100 GRT

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## Results

■ Estimated 2000 NO<sub>x</sub>: 1 million short tons

### Distribution of 2000 Mobile Source NO<sub>x</sub> Emissions

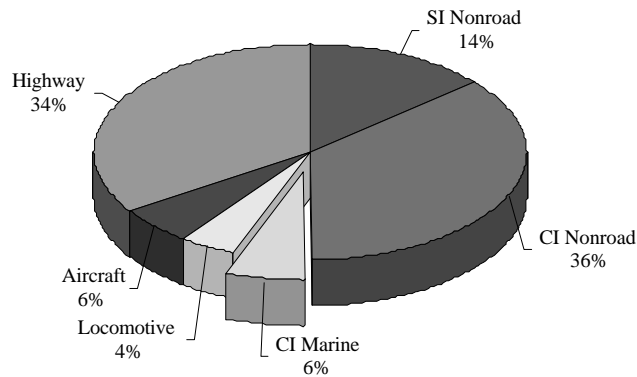


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## Results

■ Estimated 2000 PM: 42,000 short tons

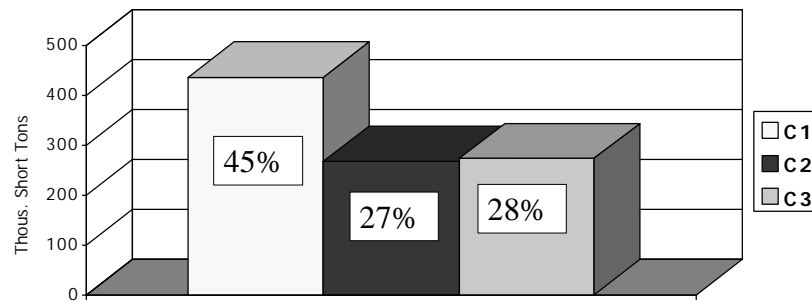
### Distribution of 2000 Mobile Source PM Emissions



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## Results

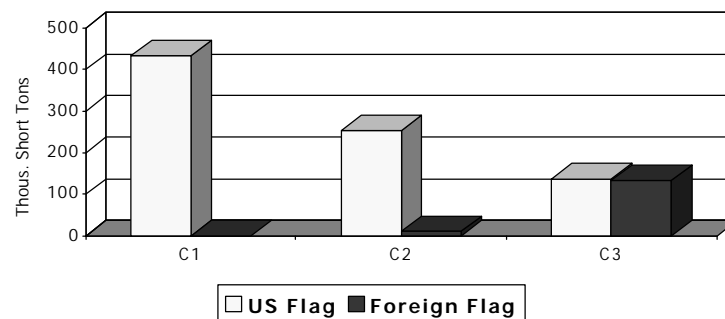
2000 Commercial CI Marine NOx Emissions  
By Category



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## Results

2000 Commercial CI Marine NOx Emissions  
By Flag



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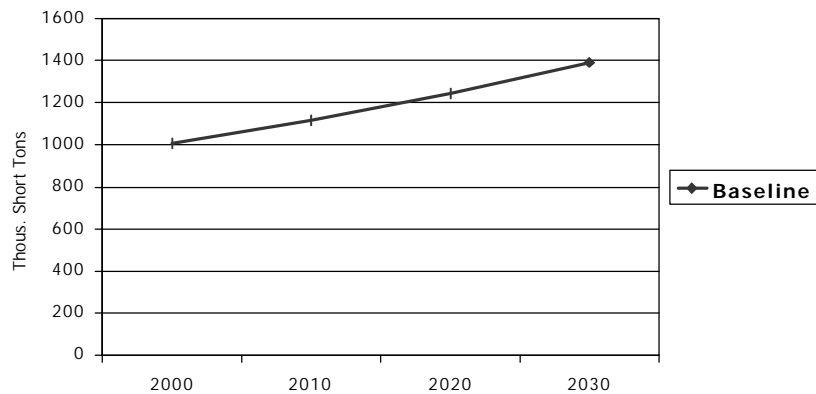
## Emission Projections

■ Projections are based on:

	Average Useful Life (Years)	Average Annual Growth Rate
C1 Recreational	15	3.5%
C1 Commercial	13	0.9%
C1 Auxiliary	17	1.5%
C2	23	1.0%
C3	23	1.0%

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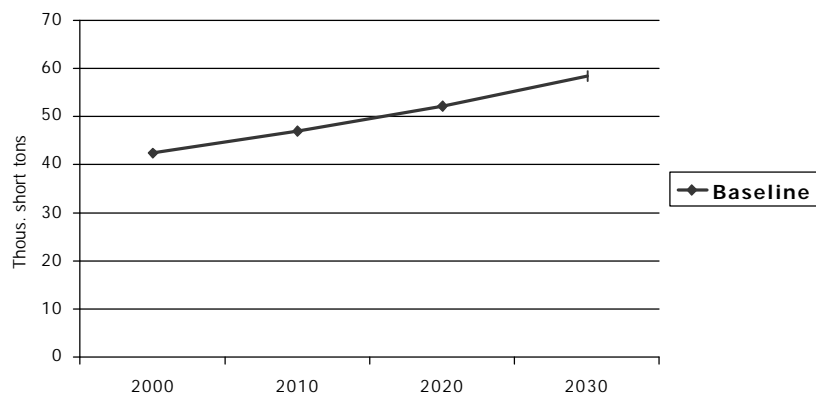
## Emission Projections - NO<sub>x</sub>



Absent any emission controls, NO<sub>x</sub> inventory  
is projected to increase by 38% by 2030

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## Emission Projections - PM



Absent any emission controls, PM inventory is projected to increase by 38% by 2030

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## Emissions for Selected Areas

### Commercial Marine Inventory Contribution to Selected Nonattainment Areas

Nonattainment Area	% Total NO <sub>x</sub>	% Total PM
Beaumont/Port Arthur	15	29
San Diego	17	33
San Francisco	12	23
CA South Coast	6	12
Baltimore	4	8

Source: *Nonroad Engine and Vehicle Emission Study Report*, November 1991 (Publication no. EPA-21A-2001 or EPA460/3-91-002), available at [www.epa.gov/otaq/nonroad.htm](http://www.epa.gov/otaq/nonroad.htm)

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